pentaerythritol, $C(CH_2OH)_4$ as a branching agent, and is end-capped in preferred embodiments by means of the use of four moles of meta- sulfobenzoyl groups per mole of pentaerythritol.

F. Polyesters containing sulfonated groups not specifically situated at the polymer chain ends

The polyester art making reference to incorporation of sulfonated aromatic groups in polyester backbones is very extensive; much of this art appears to relate to high-molecular weight, fiber-forming polyesters or polyesters used to make shaped articles. See, for example, the older art referenced above, or U.S. Pat. No. 3,416,952, McIntyre et al, issued Dec. 7, 1968. More recently, water-dissipatable or solvent-soluble polyesters containing sulfoaromatic groups have been disclosed. See, for example, U.S. Pat. Nos. 4,304,900 and 4,304,901, O'Neill, issued Dec. 8, 1981, and U.S. Pat. No. 3,563,942, Heiberger, issued Feb. 16, 1971. These patents disclose the utility as adhesives, coatings, films, textile sizes and the like of polyester compositions resembling those of the art but having particular sulfonated groups.

U.S. Pat. No. 4,427,557, Stockburger, issued Jan. 24, 1984, discloses copolyesters having relatively low (2,000 to 5,000) molecular weights, formed by the reaction of ethylene glycol, a PEG having an average molecular weight of 200 to 1,000, an aromatic dicarboxylic acid (e.g., dimethyl terephthalate), and a sulfonated aromatic dicarboxylic acid (e.g., dimethyl 5-sulfoisophthalate).

In connection with the incorporation of sulfonated aromatic dicarboxylates into polyesters, see also U.S. Pat. Nos. 3,853,820, Vachon, issued Dec. 10, 1984; 3,734,874, Kibler et al, issued May 22, 1973; and 3,546,008, Shields et al, issued Dec. 8, 1970.

G. Use of sulfobenzoyl derivatives as catalysts, modifiers and analytical reagents in polyester chemistry.

Zimmerman et al, Faserforsch. Textiltech., 18 (11), 536–7, 1967, report that o-sulfobenzoic anhydride can be used in a procedure for determining the hydroxyl end-groups in poly(ethylene terephthalate). Japanese Patent Document Nos. 5/25326, Japan Ester Co., published Feb. 10, 1982 and 6/98230, Japan Ester Co., published Aug. 7, 1981 report the use of $3–4\times10^{-4}$ molar o- and m- sulfobenzoic acids as catalysts in the synthesis of high molecular weight poly(ethylene terephthalate). Japanese Patent Document No. 61/275422, Teijin Ltd., published Dec. 5, 1986, discloses the use of 2 mole % (based on terephthalate) of sodium 2-hydroxyethyl m-sulfobenzoate as a modifier for use during synthesis of polyester fibers.

H. Prepolymers and sulfobenzoyl catalysts in polyester synthesis

Japanese Patent Document No. 60/250028, Nippon Ester, published Dec. 10, 1985, discloses prepolymerization of bis(hydroxyethyl)terephthalate to form a prepolymer having low intrinsic viscosity, which is further polymerized in the presence of sulfonic acid derivatives such as benzenesulfonic acid and o-sulfobenzoic anhydride; propylene glycol, 1,4-cyclohexanedimethanol or pentaerythritol can optionally be present.

I. Ethylene terephthalate/PEG terephthalate soil release polyesters used in laundry detergent and related consumer-usable compositions

U S. Pat. No. 4,116,885, Derstadt et al, issued Sept. 26, 1978, discloses laundry detergent compositions containing from 0.15 to 25% (most preferably 0.5 to 10%) of an ethylene terephthalate/PEG terephthalate soil release polyester, such as MILEASE T.

U.S. Pat. No. 4,132,680, Nicol, issued Jan. 2, 1979, also discloses laundry detergent compositions having soil release properties which comprise a soil release polyester having a molecular weight of 10,000 to 50,000, e.g., MILEASE T. Polyesters have also been disclosed for use in rinse-added consumer laundry products, in dryer-added products, and in certain built liquid detergents. See Canadian Patent No. 1,100,262, Becker et al, issued July 8, 1975; U.S. Pat. No. 3,712,873, Zenk, issued Jan. 23, 1973; U.S. Pat. No. 4,238,531, Rudy et al, issued Dec. 9, 1980; and British Patent Application No. 2,172,608, Crossin, published Sept. 24, 1986.

SUMMARY OF THE INVENTION

The present invention encompasses oligomeric or low molecular weight polymeric, substantially linear, sulfoaroyl end-capped esters, said esters comprising unsymmetrically substituted oxy-1,2-alkyleneoxy units, and terephthaloyl units, in a mole ratio of said unsymmetrically substituted oxy-1,2-alkyleneoxy units to said terephthaloyl units ranging from about 2:1 to about 1:24. (Mixtures of such esters with reaction by-products and the like retain their utility as fabric soil release agents when they contain at least 10% by weight of said linear, end-capped esters.) The esters herein are of relatively low molecular weight (i.e., outside the range of fiber-forming polyesters) typically ranging from about 500 to about 20,000.

The essential end-capping units herein are anionic hydrophiles, connected to the esters by means of aroyl groups. Preferably, the anion source is a sulfonated group, i.e., the preferred end-capping units are sulfoaroyl units, especially these of the formula $(MO_3S)(C_6H_4)C(O)$—, wherein M is a salt-forming cation such as Na or tetraalkylammonium.

The essential "unsymmetrically substituted oxy-1,2-alkyleneoxy" units of the esters herein are units selected from the group consisting of (a) —$OCH(R^a)CH(R^b)O$— units, wherein R^a and R^b are selected so that in each of said units, one of said groups is H and the other is a non-hydrogen R group, and (b) mixtures of the foregoing units wherein the non-hydrogen R groups are different. Mixtures of the unsymmetrical units (a) or (b) with —OCH_2CH_2O— units are also acceptable, provided that the units taken together have, overall, a sufficiently unsymmetrical character. A convenient measure of the unsymmetrical character required is given by the mole ratio of units (a) or (b) to —OCH_2CH_2O— units, which must lie in the range from about 1:10 to about 1:0. In the above, R is always a nonhydrogen, noncharged group, has low molecular weight (typically below about 500), is chemically unreactive (especially in that it is a nonesterifiable group), and is comprised of C and H, or of C,H and O. In the above-defined mixtures of units (a) or (b) with —OCH_2CH_2O— units, specifically excluded are poly(oxyethylene)oxy units, i.e., —$(OCH_2CH_2)_nO$— wherein n is a number greater than or equal to 2; (such poly(oxyethylene)oxy units form a separate category of units the use of which is optional, as further defined hereinafter). The preferred R groups are selected from the group consisting of lower n-alkyl groups, such as methyl, ethyl, propyl and butyl. Thus, the preferred oxy-1,2-alkyleneoxy units are oxy-1,2-propyleneoxy, oxy-1,2-butyleneoxy, oxy-1,2-pentyleneoxy and oxy-1,2-hexyleneoxy units. Especially preferred by way of oxy-1,2-alkyleneoxy units are oxy-1,2-propy-